TORQ Analysis of Commercial and Industrial Designers to Industrial Engineers

INPUT SECTION:

Transfer	Title	O*NET	Filters		
From Title:	Commercial and Industrial Designers	27-1021.00	Abilities:	Importance LeveL: 50	Weight: 1
To Title:	Industrial Engineers	17-2112.00	Skills:	Importance LeveL: 69	Weight: 1
Labor Market Area:	Maine Statewide		Knowledge:	Importance Level: 69	Weight: 1

OUTPUT SECTION:

Grand TORQ: 87

Ability TORQ		Skills TORQ		Knowledge TORQ	
Level	87	Level	87	Level	86

Gaps To Narrow if Possible

Ability	Level	Gap	Impt
Mathematical Reasoning	64	23	75
Deductive Reasoning	71	16	81
Inductive Reasoning	66	16	72
Written Expression	66	16	65
Visualization	66	15	68
Oral Expression	69	12	84
Problem Sensitivity	62	12	78
Information Ordering	69	12	72
Written Comprehension	69	12	68
Oral Comprehension	67	10	78
Category Flexibility	57	9	53
Fluency of Ideas	60	5	59
Near Vision	57	4	65

Upgrade These Skills

Skill	Level	Gap	Impt
Active Listening	69	12	73
Reading Comprehension	71	2	72
Complex Problem Solving	64	2	71

Knowledge to Add

Knowledge	Level	Gap	Impt
Production and Processing	73	21	85
Engineering and Technology	74	3	87
Mathematics	74	2	83

LEVEL and IMPT (IMPORTANCE) refer to the Target Industrial Engineers. GAP refers to level difference between Commercial and Industrial Designers and Industrial Engineers.

ASK ANALYSIS

Ability Level Comparison - Abilities with importance scores over 50

Description	Commercial and Industrial Designers	Industrial Engineers	Importance
Oral Expression	57	69	84
Deductive Reasoning	55	71	81
Oral Comprehension	57	67	78
Problem Sensitivity	50	62	78
Mathematical Reasoning	41	64	75
Inductive Reasoning	50	66	72
Information Ordering	57	69	72
Speech Clarity	46	39	72
Written Comprehension	57	69	68
Visualization	51	66	68
Written Expression	50	66	65
Near Vision	53	57	65
Fluency of Ideas	55	60	59
Originality	55	55	59
Speech Recognition	44	41	59
Category Flexibility	48	57	53

Skill Level Comparison - Abilities with importance scores over 69

Description	Commercial and Industrial Designers	Industrial Engineers	Importance
Critical Thinking	65	62	76
Active Listening	57	69	73
Time Management	67	57	73
Reading Comprehension	69	71	72
Complex Problem Solving	62	64	71

Knowledge Level Comparison - Knowledge with importance scores over 69

Description	Commercial and Industrial Designers	Industrial Engineers	Importance
Engineering and Technology	71	74	87
Production and Processing	52	73	85

Mathematics	72	74	83

Experience & Education Comparison

Related Work Experience Comparison

Description	Commercial and Industrial Designers	Industrial Engineers
10+ years	0%	1%
8-10 years	0%	14%
6-8 years	30%	0%
4-6 years	21%	14%
2-4 years	9%	26%
1-2 years	12%	0%
6-12 months	9%	30%
3-6 months	6%	0%
1-3 months	9%	0%
0-1 month	0%	0%
None	0%	12%

Required Education Level Comparison

Description	Commercial and Industrial Designers	Industrial Engineers
Doctoral	0%	0%
Professional Degree	0%	0%
Post-Masters Cert	0%	0%
Master's Degree	7%	0%
Post-Bachelor Cert	6%	1%
Bachelors	55%	85%
AA or Equiv	18%	0%
Some College	0%	12%
Post-Secondary Certificate	9%	0%
High Scool Diploma or GED	2%	0%
No HSD or GED	0%	0%

Commercial and Industrial Designers	Industrial Engineers
Most Common Educational/Training Requirement:	
Bachelor's degree	Bachelor's degree
Job Zone Comparison	
4 - Job Zone Four: Considerable Preparation Needed	4 - Job Zone Four: Considerable Preparation Needed
A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.	A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.
Most of these occupations require a four - year bachelor's degree, but some do not.	Most of these occupations require a four - year bachelor's degree, but some do not.
Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.	Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.

Tasks

Commercial and Industrial Designers

Core Tasks

Generalized Work Activities:

- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.
- Thinking Creatively - Developing, designing, or creating new applications, ideas, relationships, systems, or products,

Industrial Engineers

Core Tasks

Generalized Work Activities:

- Communicating with Supervisors, Peers, or Subordinates - Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.
- Making Decisions and Solving Problems - Analyzing information and evaluating results to choose the best solution and solve problems.
- Interacting With Computers - Using computers and computer systems (including hardware and software) to

including artistic contributions.

- Updating and Using Relevant Knowledge - Keeping up-to-date technically and applying new knowledge to your job.
- Communicating with Supervisors, Peers, or Subordinates - Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.
- Identifying Objects, Actions, and Events - Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.

Specific Tasks

Occupation Specific Tasks:

- Advise corporations on issues involving corporate image projects or problems.
- Confer with engineering, marketing, production, or sales departments, or with customers, to establish and evaluate design concepts for manufactured products.
- Coordinate the look and function of product lines.
- Design graphic material for use as ornamentation, illustration, or advertising on manufactured materials and packaging or containers.
- Develop industrial standards and regulatory guidelines.
- Develop manufacturing procedures and monitor the manufacture of their designs in a factory to improve operations and product quality.
- Direct and coordinate the fabrication of models or samples and the drafting of working drawings and specification sheets from sketches.
- Evaluate feasibility of design ideas, based on factors such as appearance, safety, function, serviceability, budget, production costs/methods, and market characteristics.
- Fabricate models or samples in paper, wood, glass, fabric, plastic, metal, or other materials, using hand or power tools.
- Investigate product characteristics such as the product's safety and handling qualities, its market appeal, how efficiently it can be produced, and ways of distributing, using and maintaining it.
- Modify and refine designs, using working models, to conform with customer specifications, production limitations, or changes in design trends.
- Participate in new product planning or market research, including studying the potential need for new products.
- Prepare sketches of ideas, detailed drawings, illustrations, artwork, or blueprints, using drafting instruments, paints and brushes, or computer-aided

program, write software, set up functions, enter data, or process information.

- Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.
- Analyzing Data or Information - Identifying the underlying principles, reasons, or facts of information by breaking down information or data into separate parts.

Specific Tasks

Occupation Specific Tasks:

- Analyze statistical data and product specifications to determine standards and establish quality and reliability objectives of finished product.
- Apply statistical methods and perform mathematical calculations to determine manufacturing processes, staff requirements, and production standards.
- Communicate with management and user personnel to develop production and design standards.
- Complete production reports, purchase orders, and material, tool, and equipment lists.
- Confer with vendors, staff, and management personnel regarding purchases, procedures, product specifications, manufacturing capabilities, and project status.
- Coordinate quality control objectives and activities to resolve production problems, maximize product reliability, and minimize cost.
- Develop manufacturing methods, labor utilization standards, and cost analysis systems to promote efficient staff and facility utilization.
- Direct workers engaged in product measurement, inspection, and testing activities to ensure quality control and reliability.
- Draft and design layout of equipment, materials, and workspace to illustrate maximum efficiency using drafting tools and computer.
- Estimate production cost and effect of product design changes for management review, action, and control.
- Evaluate precision and accuracy of production and testing equipment and engineering drawings to formulate corrective action plan.
- Formulate sampling procedures and designs and develop forms and instructions for recording, evaluating, and reporting quality and reliability data.
- Implement methods and procedures for disposition of discrepant material and defective or damaged parts, and assess cost and responsibility.

design equipment.

- Present designs and reports to customers or design committees for approval, and discuss need for modification.
- Read publications, attend showings, and study competing products and design styles and motifs to obtain perspective and generate design concepts.
- Research production specifications, costs, production materials and manufacturing methods, and provide cost estimates and itemized production requirements.
- Supervise assistants' work throughout the design process.

Detailed Tasks

Detailed Work Activities:

- analyze market conditions
- analyze project proposal to determine feasibility, cost, or time
- analyze technical data, designs, or preliminary specifications
- communicate visually or verbally
- confer with client or staff regarding theme
- confer with other departmental heads to coordinate activities
- consult with customers concerning needs
- coordinate activities of assistants
- create art from ideas
- distinguish details in graphic arts material
- draw designs, letters, or lines
- draw prototypes, plans, or maps to scale
- estimate production costs
- evaluate product design
- evaluate product quality for sales activities
- fabricate craft or art objects
- follow manufacturing methods or techniques
- identify color or balance
- identify problems or improvements
- maintain consistent production quality
- make presentations
- organize commercial artistic or design projects
- prepare artwork for camera or press
- read blueprints
- recommend improvements to work methods or procedures
- recommend solutions of administrative problems
- schedule work to meet deadlines
- sketch or draw subjects or items
- understand artistic crafts production methods
- use characteristics of graphic design materials

- Plan and establish sequence of operations to fabricate and assemble parts or products and to promote efficient utilization.
- Recommend methods for improving utilization of personnel, material, and utilities.
- Record or oversee recording of information to ensure currency of engineering drawings and documentation of production problems.
- Regulate and alter workflow schedules according to established manufacturing sequences and lead times to expedite production operations.
- Review production schedules, engineering specifications, orders, and related information to obtain knowledge of manufacturing methods, procedures, and activities.
- Schedule deliveries based on production forecasts, material substitutions, storage and handling facilities, and maintenance requirements.
- Study operations sequence, material flow, functional statements, organization charts, and project information to determine worker functions and responsibilities.

Detailed Tasks

Detailed Work Activities:

- advise clients regarding engineering problems
- analyze effectiveness of safety systems or procedures
- analyze engineering design problems
- analyze scientific research data or investigative findings
- analyze technical data, designs, or preliminary specifications
- assign work to staff or employees
- calculate engineering specifications
- communicate technical information
- confer with engineering, technical or manufacturing personnel
- coordinate engineering project activities
- coordinate production materials, activities or processes
- design manufacturing processes or methods
- determine factors affecting production processes
- develop policies, procedures, methods, or standards
- develop safety regulations
- direct personnel in support of engineering activities
- establish production schedule
- estimate materials or labor requirements

- use computer aided drafting or design software for design, drafting, modeling, or other engineering tasks
- use computer graphics design software
- use computers to enter, access or retrieve data
- use creativity in graphics
- use creativity in industrial artistry
- use creativity to art or design work
- use drafting or mechanical drawing techniques
- use graphic arts techniques
- use hand or power tools
- use marketing techniques
- use product knowledge to market goods

Technology - Examples

Computer aided design CAD software

- Ashlar-Vellum Cobalt
- Autodesk AliasStudio
- Autodesk AutoCAD software
- Autodesk Maya software
- Dassault Systemes CATIA software
- PTC Pro/ENGINEER software
- Siemens PLM Software UGS NX
- SolidWorks CAD software

Data base user interface and query software

- Microsoft Access

Desktop publishing software

- Adobe Systems Adobe InDesign
- Microsoft Publisher
- QuarkXpress

Document management software

- Adobe Systems Adobe Acrobat software

Electronic mail software

- Email software

Graphics or photo imaging software

- Adobe Systems Adobe FreeHand
- Adobe Systems Adobe Illustrator
- Adobe Systems Adobe Photoshop software
- Corel CorelDraw Graphics Suite
- Corel Painter

- estimate production costs
- evaluate engineering data
- evaluate equipment for compliance with standards
- evaluate manufacturing or processing systems
- examine engineering documents for completeness or accuracy
- explain complex mathematical information
- follow manufacturing methods or techniques
- follow statistical process control procedures
- improve test devices or techniques in manufacturing, industrial or engineering setting
- inspect facilities or equipment for regulatory compliance
- lead teams in engineering projects
- perform safety inspections in industrial, manufacturing or repair setting
- perform statistical modeling
- plan testing of engineering methods
- prepare safety reports
- prepare technical reports or related documentation
- read blueprints
- read production layouts
- read technical drawings
- record test results, test procedures, or inspection data
- resolve engineering or science problems
- study time, motion, or work methods of workers
- supervise quality control workers
- understand engineering data or reports
- use cost benefit analysis techniques
- use drafting or mechanical drawing techniques
- use hazardous materials information
- use library or online Internet research techniques
- use long or short term production planning techniques
- use mathematical or statistical methods to identify or analyze problems
- use project management techniques
- use quality assurance techniques
- use scientific research methodology
- use technical information in manufacturing or industrial activities
- use technical regulations for engineering problems
- use total quality management practices

Technology - Examples

Analytical or scientific software

- McNeel Rhino software
- Xara Xtreme

Internet browser software

- Web browser software

Office suite software

- Microsoft Office

Presentation software

- Microsoft PowerPoint

Spreadsheet software

- Microsoft Excel

Video creation and editing software

- Autodesk 3ds Max
- Chaos Group V-Ray
- MAXON CINEMA 4D
- Softimage XSI

Word processing software

- Microsoft Word

Tools - Examples

- Desktop computers
- Compact digital cameras
- Universal serial bus USB flash drives
- Liquid crystal display LCD video projectors
- Laptop computers
- Personal computers

- 3D Static Strength Prediction Program 3DSSPP software
- A mathematical programming language AMPL
- ABAQUS software
- Automatic dynamic incremental nonlinear analysis ADINA software
- Data acquisition software
- Dataxiom StatMost
- Design of experiments DOE software
- Discrete event simulation software
- ECHIP software
- ETA Dynaform
- Finite element method FEM software
- Human modeling software
- ILOG CPLEX
- MAGMA MAGMASOFT
- Maplesoft Maple
- MAYA I-DEAS
- Minitab software
- Modular arrangement of predetermined time standards software MODAPTS
- Neural network modeling software
- NeuralWare software
- Optimization software
- PMC KanbanSIM
- Production flow analysis software
- ProModel software
- Robotic simulation software
- Rockwell Automation Arena
- SAS software
- StatGraphics software
- Statistical software
- Stratasys FDM MedModeler
- Task analysis software

- The Mathworks MATLAB
- Three-dimensional simulation translation software
- Time and motion analysis software
- UGS Jack
- Windward Technologies GRG2
- Wolfram Research Mathematica
- Workcell simulation software

Charting software

- Microsoft Office Visio

Computer aided design CAD software

- Autodesk AutoCAD software
- Electronic breadboard software
- Facilities design software
- Facilities planning software
- International TechneGroup IGESworks
- Main Injector Neutrino Oscillation Search MINOS software
- Mathsoft Mathcad
- PTC Pro/ENGINEER software
- SolidWorks CAD software
- UGS Solid Edge

Computer aided manufacturing CAM software

- Computer aided manufacturing CAM software
- EGS FeatureCAM

Development environment software

- Extensible markup language XML
- Microsoft Visual Basic
- Microsoft Visual Basic Scripting Edition VBScript
- Microsoft Visual Studio
- National Instruments LabVIEW

Expert system software

- Decision support software

Industrial control software

- Allen Bradley PanelView
- Assembly line balancing software

- Computer numerical control CNC software
- Human machine interface HMI software
- Numerical control software
- Nupro CastView
- Quality control software
- Robotic control software

Inventory management software

- Inventory management software
- Manhattan Associates PkMS Pickticket
- Oracle Retek
- Warehouse management software

Materials requirements planning logistics and supply chain software

- Capacity planning software
- Materials requirements planning MRP software
- Production scheduling and planning software

Object or component oriented development software

- C++
- Sun Microsystems Java

Presentation software

- Microsoft PowerPoint

Program testing software

- Logic programming software
- Rockwell RSLogix
- User interface design software

Project management software

- Microsoft Project
- Personnel scheduling software
- Process reengineering software
- Yield management systems

Spreadsheet software

- Microsoft Excel

Word processing software

- Microsoft Word

Tools - Examples

- Reverberant auditory test chambers
- Anechoic auditory test chambers
- Audiometers
- Camera controllers
- Heart rate monitors
- Audio tape recorders
- Computer servers
- Coordinate measuring machines CMM
- Digital cameras
- Pressure transducers
- Audio equalizers
- Fast Fourier transform FFT spectrum analyzers
- Environmental chambers
- Hydraulic power units
- Hydraulic presses
- Hardness testers
- Electrophysics infrared cameras
- Motion control systems
- Optical benches
- Environmental ovens
- Laser printers
- Load cells
- Pulsed width modulation PWM drives
- Inverted metallurgical microscopes
- Microcontrollers
- Recording microphones
- Variable frequency drives VFD
- Multimeters
- Audio amplifiers
- Oxygen uptake measurement devices
- Personal computers
- Photometers

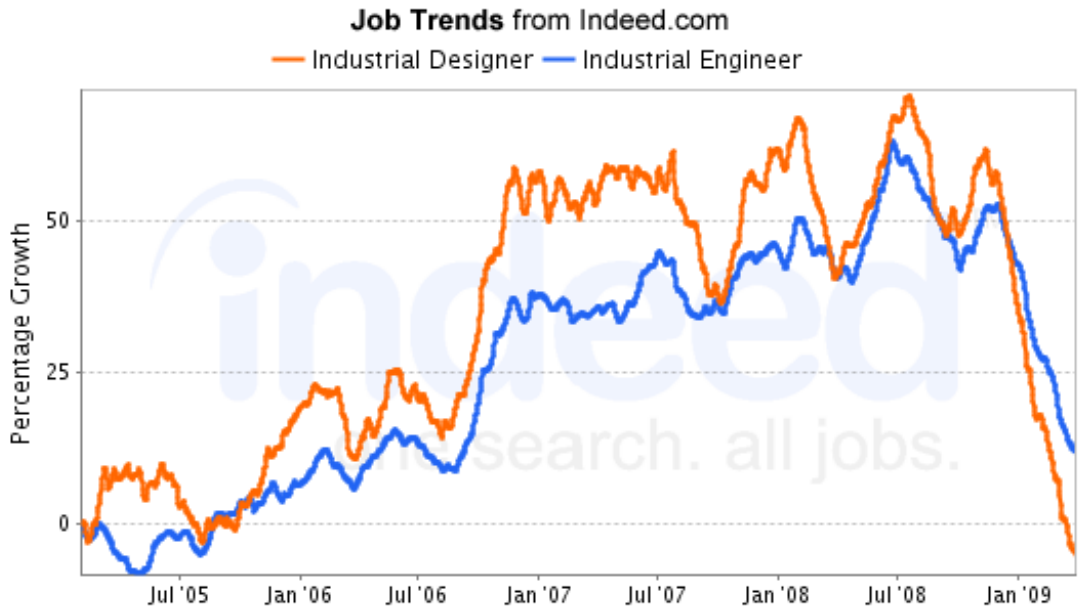
• Electrogoniometers
• Potentiometers
• Force plates
• Radiometers
• Time delay relay panel boxes
• Signal generators
• Noise-logging dosimeters
• Tensile testing machines
• Thermocouples
• Anthropometers
• Torsionmeters
• Programmable logic controller PLC controlled turntables
• Vibration tables

Labor Market Comparison

Description	Commercial and Industrial Designers	Industrial Engineers	Difference
Median Wage	$ 49,170	$ 68,350	$ 19,180
10th Percentile Wage	$ 29,790	$ 45,510	$ 15,720
25th Percentile Wage	N/A	N/A	N/A
75th Percentile Wage	$ 72,210	$ 82,530	$ 10,320
90th Percentile Wage	$ 81,030	$ 97,510	$ 16,480
Mean Wage	$ 53,870	$ 69,240	$ 15,370
Total Employment - 2007	140	580	440
Employment Base - 2006	153	630	477
Projected Employment - 2016	160	701	541
Projected Job Growth - 2006-2016	4.6 %	11.3 %	6.7 %
Projected Annual Openings - 2006-2016	5	22	17

National Job Posting Trends

Trend for Commercial and Industrial Designers	Trend for Industrial Engineers



Data from Indeed

Recommended Programs

Industrial Engineering

Industrial Engineering. A program that prepares individuals to apply scientific and mathematical principles to the design, improvement, and installation of integrated systems of people, material, information, and energy. Includes instruction in applied mathematics, physical sciences, the social sciences, engineering analysis, systems design, computer applications, and forecasting and evaluation methodology.

Institution	Address	City	URL
University of Southern Maine	96 Falmouth St	Portland	www.usm.maine.edu

Maine Statewide Promotion Opportunities for Commercial and Industrial Designers

O*NET Code	Title	Grand TORQ	Job Zone	Employment	Median Wage	Difference	Growth	Annual Job Openings
27-1021.00	Commercial and Industrial Designers	100	4	140	$49,170.00	$0.00	5%	5
17-3026.00	Industrial Engineering Technicians	87	3	370	$51,700.00	$2,530.00	6%	9
17-2072.00	Electronics Engineers, Except Computer	87	4	210	$76,420.00	$27,250.00	-26%	4
17-2112.00	Industrial Engineers	87	4	580	$68,350.00	$19,180.00	11%	22
27-1022.00	Fashion Designers	87	3	60	$71,370.00	$22,200.00	19%	1
17-2121.02	Marine Architects	86	4	60	$75,520.00	$26,350.00	-9%	1

17-2131.00	Materials Engineers	85	4	40	$70,250.00	$21,080.00	-7%	1
17-2111.03	Product Safety Engineers	85	5	90	$49,940.00	$770.00	3%	3
15-1051.00	Computer Systems Analysts	84	4	1,650	$69,340.00	$20,170.00	20%	78
11-9041.00	Engineering Managers	84	5	720	$91,030.00	$41,860.00	-2%	14
17-2071.00	Electrical Engineers	84	4	260	$73,050.00	$23,880.00	-10%	6
17-2141.00	Mechanical Engineers	84	4	620	$67,210.00	$18,040.00	-9%	14
17-2111.02	Fire-Prevention and Protection Engineers	83	4	90	$49,940.00	$770.00	3%	3
27-1011.00	Art Directors	83	4	90	$66,570.00	$17,400.00	10%	7
15-1032.00	Computer Software Engineers, Systems Software	82	4	290	$73,410.00	$24,240.00	11%	8

Top Industries for Industrial Engineers

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Aerospace product and parts manufacturing	336400	7.28%	14,651	18,120	23.68%
Motor vehicle parts manufacturing	336300	6.73%	13,549	13,100	-3.31%
Semiconductor and other electronic component manufacturing	334400	5.71%	11,490	12,196	6.15%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	5.51%	11,093	12,897	16.27%
Management of companies and enterprises	551100	4.04%	8,127	11,377	40.00%
Research and development in the physical, engineering, and life sciences	541710	3.81%	7,671	9,939	29.57%
Plastics product manufacturing	326100	3.06%	6,168	7,941	28.73%
Other fabricated metal product manufacturing	332900	2.49%	5,019	5,401	7.61%
Medical equipment and supplies manufacturing	339100	2.29%	4,604	5,719	24.22%
Management, scientific, and technical consulting services	541600	2.03%	4,085	8,857	116.81%
Other general purpose machinery manufacturing	333900	1.80%	3,626	3,975	9.63%
Communications equipment manufacturing	334200	1.79%	3,600	4,406	22.41%
Computer and peripheral equipment manufacturing	334100	1.76%	3,534	2,809	-20.51%
Employment services	561300	1.55%	3,112	4,783	53.70%

Computer systems design and related services	541500	1.34%	2,701	4,429	63.97%

Top Industries for Commercial and Industrial Designers

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Self-employed workers, primary job	000601	25.29%	12,136	12,929	6.54%
Specialized design services	541400	8.84%	4,243	5,678	33.81%
Management of companies and enterprises	551100	5.03%	2,414	2,783	15.28%
Self-employed workers, secondary job	000602	4.50%	2,158	2,148	-0.45%
Motor vehicle parts manufacturing	336300	2.70%	1,296	1,032	-20.39%
Employment services	561300	2.16%	1,038	1,314	26.56%
Plastics product manufacturing	326100	1.90%	910	965	6.00%
Miscellaneous durable goods merchant wholesalers	423900	1.40%	674	774	14.80%
Advertising and related services	541800	1.37%	657	741	12.83%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	1.13%	541	518	-4.26%
Research and development in the physical, engineering, and life sciences	541710	1.11%	533	569	6.69%
Other general purpose machinery manufacturing	333900	0.94%	452	408	-9.73%
Medical equipment and supplies manufacturing	339100	0.91%	437	447	2.29%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	333400	0.90%	430	396	-8.01%
Household appliance manufacturing	335200	0.86%	410	311	-24.33%